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shoulder arthroplasty restores active motion and reduces pain for
posterosuperior cuff dysfunction**

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CORR Insights®: Latissimus Dorsi and Teres Major Transfer With Reverse Shoulder Arthroplasty Restores Active Motion and Reduces Pain for Posterosuperior Cuff Dysfunction

Karl Wieser MD

Where Are We Now?

In advanced rotator cuff deficiency, the additional loss of function of the teres minor appears to be the turning point in the natural history of the disease. The absence of the last external shoulder rotator, to counteract the internal rotators, leads to horizontal muscle imbalance with loss of active external

rotation control, external rotation lag, and inability to position and hold the hand in space. As opposed to the pseudoparalysis of anterior elevation, which can be corrected, pseudoparalysis of external rotation cannot be restored after reverse total shoulder arthroplasty alone. In 2007, Gerber and colleagues [2] introduced the combination of reverse total shoulder arthroplasty with latissimus dorsi transfer for restoration of elevation and

external rotation and presented encouraging early results. This was the combination of two proven concepts, which on their own had withstood the test of time, to address both pseudoparalysis for elevation and external rotation. Now, midterm results of this research group are available, indicating that pain relief and restoration of function is maintained for at least 5 years in most patients [4]. However, depending on patient-specific factors like comorbid conditions, prior surgical procedures, and the surgical technique used, among others, complications (even in the hands of very experienced surgeons) occur in up to 22% [4] to 29% [5] of these procedures.

In general, two different techniques are used: A two-incision technique with harvesting of the latissimus dorsi tendon and release of the muscle through a separate axillary approach and attachment of the tendon to the greater tuberosity through the approach (deltopectoral or superolateral), which is

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used for implantation of the reverse total shoulder arthroplasty. The other approach is a modified L'Episcopo technique through a single deltopectoral approach, as performed in the current study. With this technique, most surgeons usually add the transfer of the teres major tendon and reattach both tendons more inferiorly than with the first technique on the posterior aspect of the humerus diametrical to the level of their original insertion site.

Where Do We Need To Go?

Both methods have provided good functional and clinical results with relatively small patients cohorts. However, a number of unanswered concerns remain:

The insertion point. Biomechanical studies indicate that a transfer of the latissimus dorsi tendon to the posterior aspect (teres minor insertion) of the greater tuberosity provides the best external rotation moment arm [1]. As quadrilateral symptoms with axillary nerve compression have been described, positioning of the transferred tendon on this biomechanically optimal insertion point is difficult, using a one-incision technique. Clinical data, however, suggest that both, gain of active external rotation and forward flexion are more dependent on preoperative function than

on surgical technique or positioning of the transfer.

An additional transfer of the teres major. As mentioned earlier, the modified L'Episcopo technique generally is performed as a combination of latissimus dorsi and teres major transfer, whereas others describe satisfactory results with transferring the latissimus dorsi only (usually performed through a two incision technique). However, it is worth noting that the latissimus dorsi is much larger than the teres minor, and exerts a vastly larger external rotation moment than does a weakly functional teres minor; as such, it seems possible—though perhaps future studies should confirm this—that the transpositioned latissimus dorsi alone can provide sufficient external rotation power.

Achieving external rotation at the disadvantage of losing internal rotation. By transferring the latissimus dorsi, its contribution to active internal rotation is lost. Although studies have suggested that this does not lead to an important functional loss in the native shoulder [3], data on loss of internal rotation in reverse total shoulder arthroplasty is underreported. Especially in shoulders with additional subscapularis impairment, the additional transfer of a potential strong internal rotator might lead to deterioration of internal rotation. This might be tolerable in patients, who have good internal rotation on the opposite side,

but will lead to massive impairment of patients' independence (in particular with respect to perineal hygiene) in patients with bilateral internal rotation deficiency, which can occur in patients with contralateral neurologic lesions, bilateral disease, and other situations.

Patient selection. The aforementioned considerations indicate the importance of proper patient selection. The indication for the addition of a tendon transfer seems to be consistent throughout the different clinical reports with functional loss of active external rotation and positive external rotation lag sign both in adduction and abduction, as well as radiological (MR or CT) confirmed teres minor degeneration (Goutallier > 2). Contraindications are not well established.

How Do We Get There?

Enrolling patients with a clear and strong pseudoparalysis for external rotation in randomized clinical trials investigating the net benefit of an additional latissimus dorsi tendon transfer to reverse total shoulder arthroplasty is, in my opinion, rather unethical, as restoration of external rotation is never observed after reverse total shoulder arthroplasty alone. However, further biomechanical investigations and comparative clinical trails of latissimus dorsi

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transfer performed with or without additional teres major transfer, through a single deltopectoral (modified L'Episcopo) or two-incision technique are important future directions. It is notable that neurological complications may not be less frequent in the L'Episcopo technique, and neurological complications and complex regional pain syndrome will have to be included in the analysis.

Furthermore, we may have to consider reorienting our way of thinking. Perhaps we should consider adding a reverse total shoulder arthroplasty to an indicated latissimus dorsi transfer rather than vice versa, as recreating active controlled external rotation is even as important as active elevation for proper

positioning the hand in space maintaining essential activities of daily living.

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